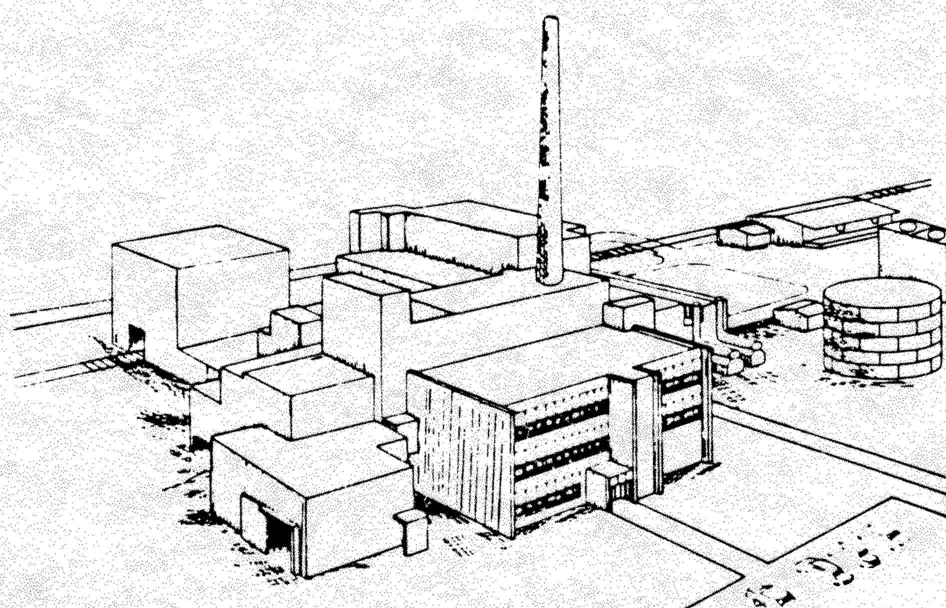
ENVIRONMENTAL MONITORING PROGRAM REPORT FOR THE WEST VALLEY DEMONSTRATION PROJECT

May 1983

West Valley Nuclear Services Co., Inc.



1982 ENVIRONMENTAL MONITORING PROGRAM REPORT FOR THE WEST VALLEY DEMONSTRATION PROJECT SITE

MAY 1983

OPERATED FOR THE U. S. DEPARTMENT OF ENERGY
By
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Disclaimer

Preface

This report is prepared and submitted in accordance with the requirements of DOE Order 5484.1 and presents environmental monitoring program data collected at the West Valley Demonstration Project (WVDP) site from February 26, 1982, through December 31, 1982. The WVDP objective is to solidify approximately 600,000 gallons of high-level liquid radioactive waste stored at the former Nuclear Fuel Services reprocessing facility at West Valley, New York. Nuclear Fuel Services conducted an environmental monitoring program in accordance with Nuclear Regulatory Commission requirements which were appropriate for shutdown maintenance operations conducted at the site. That program was embraced by West Valley Nuclear Services Company (WVNS) at the time of transition (February 26, 1982) and will be modified to provide a comprehensive monitoring program in preparation for waste solidification operations scheduled for startup in June 1988. As such, the data presented in this report is considered preoperational in nature in accordance with DOE Order 5484.1, Chapter III, Paragraph 1. The environmental monitoring program planned for the operating phase of the project will be fully implemented by fiscal year 1985 and will provide at least two years of preoperational data prior to startup.

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I. INTRODUCTION

On February 26, 1982, the operations and maintenance responsibility of the former Nuclear Fuel Services (NFS) reactor fuel reprocessing facility was transferred to the Department of Energy (DOE). Public Law No. 96-368, enacted in 1980, mandated the demonstration of high-level radioactive waste management technology for solidification of commercial fuel reprocessing liquid wastes held in underground storage tanks at the facility. West Valley Nuclear Services Company (WNVS) is the contractor selected by the DOE to implement the provisions of this law.

At the time operational control of the facility was assumed by WVNS, NFS was conducting an environmental monitoring program appropriate to the shutdown maintenance operating status of the facility in accordance with Technical Specification 5.1 under NRC License CSF-1. WVNS recognized that the scope of the NFS program required substantial change in order to prepare for high-level waste solidification operations which are currently scheduled for start-up in June 1988. WVNS initiated work on implementation of a full-scale environmental monitoring program in support of the planned operations and will have the expanded program fully implemented by fiscal year 1985. This schedule will allow more than two years (as recommended in DOE Order 5484.1, Chapter II, paragraph 1) to gather preoperational environmental baseline data for the site in advance of solidification operations.

This report is submitted in accordance with DOE Order 5484.1 and represents a summary of environmental monitoring data collected under the requirements of Technical Specification 5.1. Portions of the data required for reporting in accordance with DOE Order 5484.1 are not available at this time. The program developed and being implemented by WVNS will provide data in full compliance with the DOE requirements by fiscal year 1985 and is being developed in preparation for the required preoperational survey program.

The reprocessing plant, although not functional for its orginal purpose, is retained in a shutdown status which requires continual operation and maintenance of basic services, including low-level radioactive waste treatment. The facility activities also include periodic operation of radioactive waste disposal area used for decontamination and operational maintenance wastes (plant wastes). Liquid wastes resulting from the plant activities are processed on-site prior to discharge at the low-level waste treatment facility (LLWT).

The WVDP site is located approximately 50 km (30 miles) south of Buffalo, New York (Figure 1), in a rural setting on New York State's western plateau at an average elevation of 400 m (1,300 feet). The site facilities occupy approximately 100 hectares (250 acres) of chain-linked fenced area within a 1,350 hectare (3,300 acre) reservation which constitutes the Western New York Nuclear Service Center (WNYNSC) under the control of New York State ERDA. The communities of West Valley, Riceville, Ashford Hollow, and the village of Springville are located within 8 km (5 miles) of the plant. No human habitation, hunting, fishing, or public access is permitted on the WNYNSC although several roads and one railway pass through the Center.

The average annual temperature in the region is 7.2°C (45.0°F) with recorded extremes of 37°C (98.6°F) and -42°C (-43.6°F). Rainfall is relatively high, averaging about 104 cm (41 inches) per year. Precipitation is evenly distributed throughout the year being markedly influenced by the presence of Lakes Erie and Ontario to the west and north, respectively. All surface drainage from the WNYNSC is to Buttermilk Creek which flows into Cattaraugus Creek and ultimately into Lake Erie. The water-mediated pathways to man in this region are not well defined at this time. Regional winds are predominantly from the west and south at over 4 meters/second (13 feet/second) during the majority of the year. WVNS is currently studying the influences of local topography on site wind patterns. Wind rose data and site specific meteorological information are not available at this time and are not expected to be developed and documented until fiscal year 1984.

The WNYNSC lies within the northern hardwoods forest region, with a large range of vegetation typical of the area. The site is equally divided between forest land and open land with habitats especially attractive to white-tailed deer and the various birds, reptiles, and small mammals indigenous to the region.

The site is geologically characterized by glacial deposits of varying thickness in the valley areas, underlain by sedimentation rocks which become exposed in the upper drainage channels on hillsides. The soil is principally

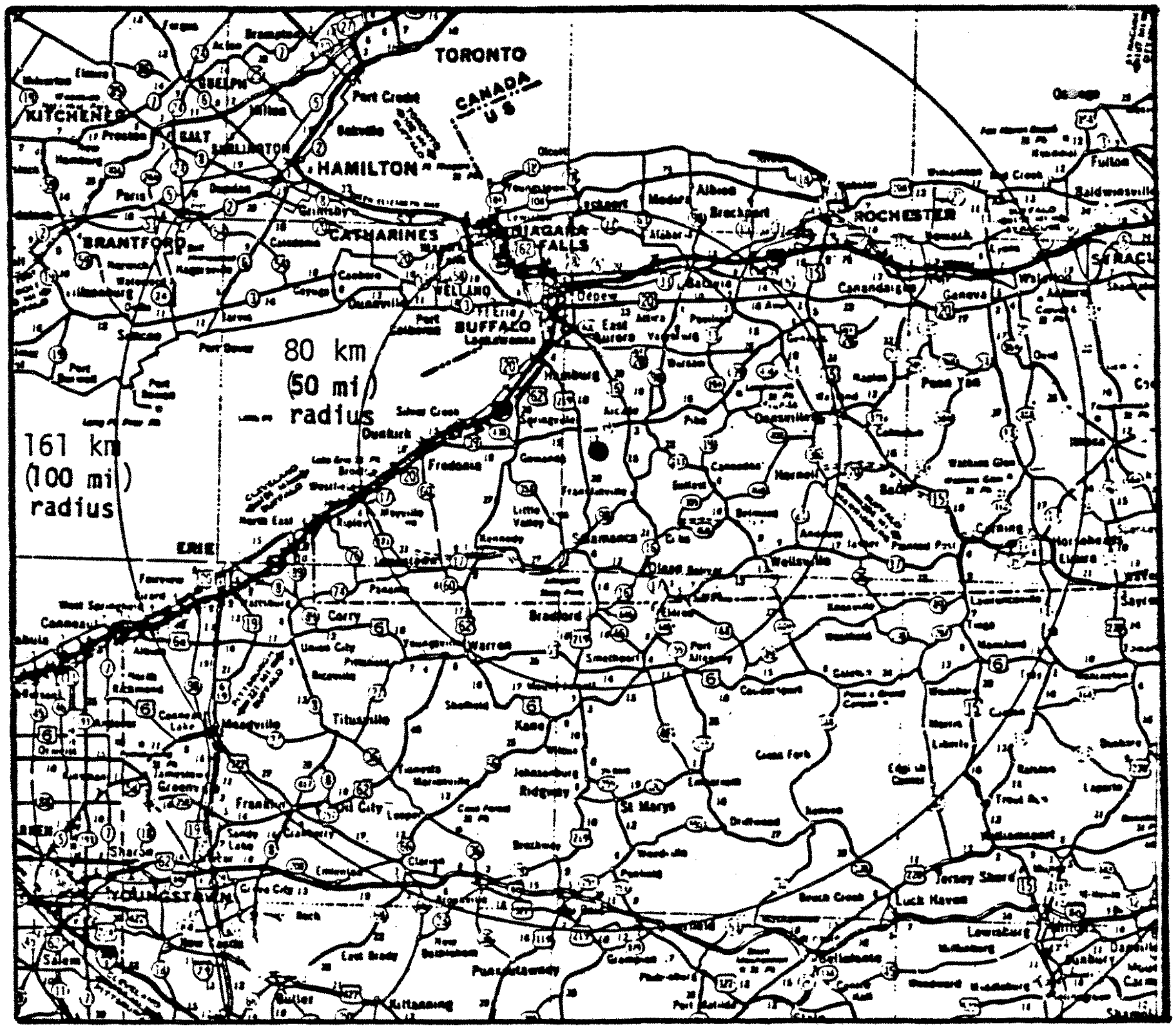


Figure 1 - Location of Western New York Nuclear Service Center

silty till, consisting of unconsolidated rock fragments, pebbles, sand, and clays. An aquifer exists in the upper 6 meters (20 feet) of granular fluvial materials concentrated near the western edge of the site; high ground to the west and the Buttermilk Creek drainage to the east isolate this aquifer from off-site continuity. Several shallow isolated water-bearing strata also occur at various other locations within the site boundary but do not appear to be continuous. The zone at which the till meets bedrock forms another aquifer, which ranges in depth from 2 meters (6 feet) underground on the hillsides to 170 meters (560 feet) deep just east of the facility exclusion area boundary.

II. SUMMARY

The results of the 1982 environmental monitoring program indicate that with the exception of certain biological media, radioactivity from the WNYNSC could not be distinguished from natural background or worldwide fallout in the region. Although some radioactive effluents were discharged during the course of Project activities, concentrations of radioactivity in air and water were well within the requirements of DOE Order 5480.1, Chapter XI, and the resultant doses from these releases to the surrounding population were of no health consequence.

There was no statistical difference in particulate beta concentrations in air as measured at the site boundary station and those reported from a New York State Department of Environmental Conservation 1981 background sample point (Reference 1). Of the radiological analyses of the water off site in Cattaraugus Creek, the two detectable isotopes were tritium and strontium-90. Although Buttermilk Creek is not used as a human drinking water supply, the water is accessible to dairy cattle at one location on the Creek. Milk samples from this herd were not statistically different from a remote background sample; a comparison with samples taken and reported by NFS in 1981 shows a decrease in Sr-90 in milk during 1982 for this herd. Site perimeter thermoluminescent dosimeters indicated that radiation exposure was within the range expected for natural background in this region.

Non-radiological monitoring data indicated intermittent levels of iron in water discharged from the site exceeding permitted levels. This was attributed to an abnormal concentration of naturally occurring iron in the site water supply treatment system and subsequent release to an on-site effluent stream. No health or environmental hazard resulted from the release; the annual average measured concentrations were less than the maximum permitted levels. Other nonradiological parameters measured were well within the specified limitations.

Very low, but nonetheless measurable, amounts of particulate and gaseous (I-129) radioactivity are released from the plant stack at levels near the analytical detection limit. Calculated doses to the maximum exposed individual living the entire year within 1,200 meters (3,900 feet) of the plant stack are less than 0.0001 mrem as a result of these discharges.

III. MONITORING PROGRAM AND RESULTS

The environmental monitoring network was retained essentially unchanged after the transfer of operational responsibility from NFS to WVNS. An initial evaluation of the environmental program which was in place at the time of transition showed an acceptable level of monitoring for the plant conditions as they existed. It was also determined, however, that to support future project activities, an expanded and upgraded monitoring system would be required. Future reports will reflect the changes being implemented to provide the proper level of environmental monitoring coverage in preparation for the project high-level waste solidification activities.

The basic media collected for analysis include surface water, groundwater, air, and biological samples. The major pathways for off-site movement of radionuclides are by surface water runoff and airborne transport. One other less quantifiable means is through the potential ingestion and assimilation of radionuclides by game animals and fish which include the WNYNSC in their range. In addition to the radiological environmental monitoring program, WVNS participates in the State Pollution Discharge Elimination System (SPDES) and operates under state-issued air and water discharge permits.

Radiological Environmental Monitoring Program

This section of the report addresses the monitoring of air, water, and biological media for radioactive contmination. The data reported are those required by Technical Specification 5.1 and are compared to appropriate limit values where applicable.

Air Sampling

Airborne particulate radioactivity is sampled off site continuously by three air samplers at the locations shown in Figure 2 (on site effluent locations are shown in Figure 3). Each Tracerlab air sampler, mounted on a four-meter high tower, maintains an average air flow of about 40 lpm (1.5 ft^3/min) through a Gelman 47 mm type A-E glass fiber filter. The filters are collected weekly and are analyzed after a seven-day decay period to remove interference from short-lived naturally occurring radioactivity. Gross alpha and gross beta measurements were made for each filter using low-background gas proportional counters. In all cases, the measured activities were below the DOE 5480.1 concentration guides for release to an uncontrolled area for the

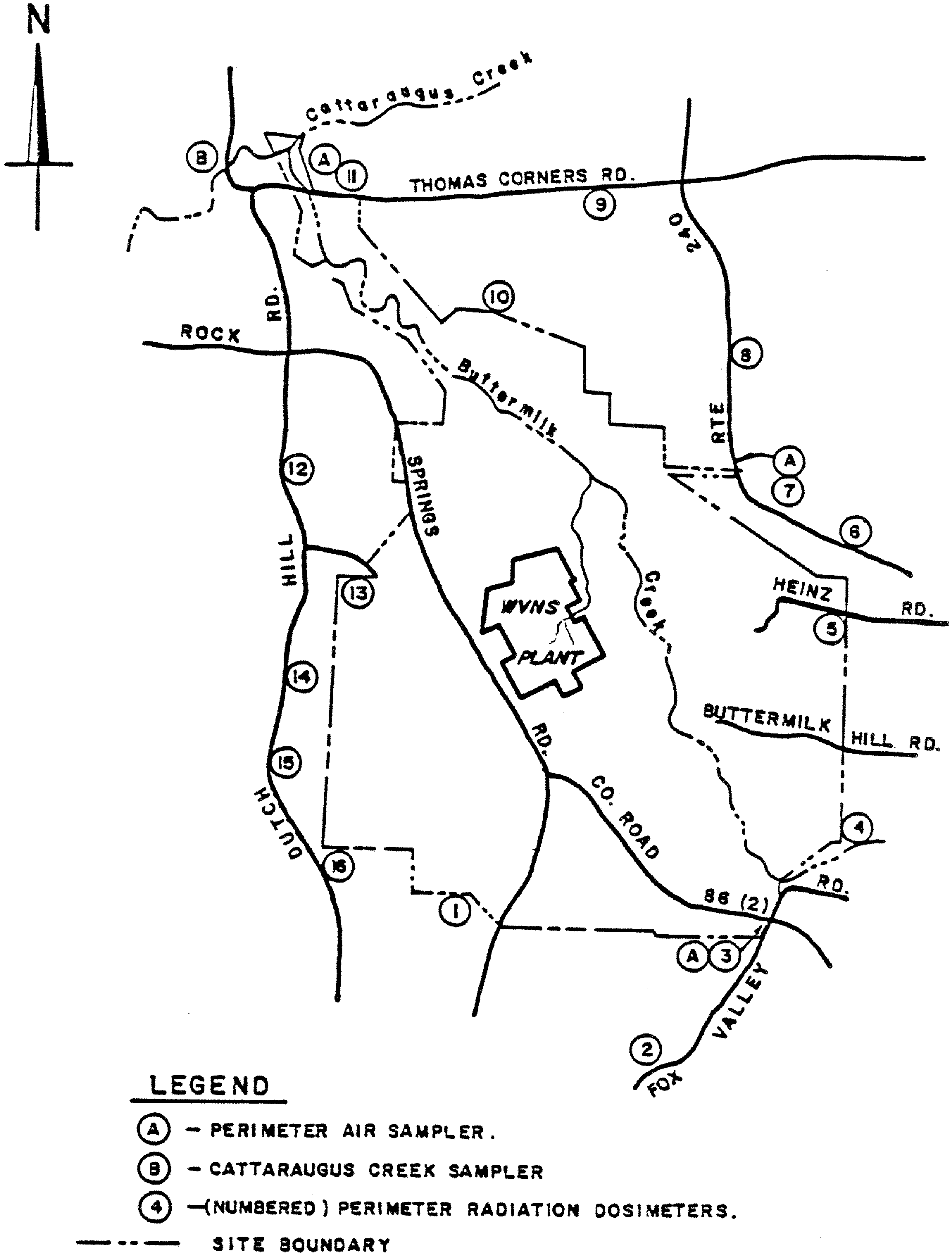
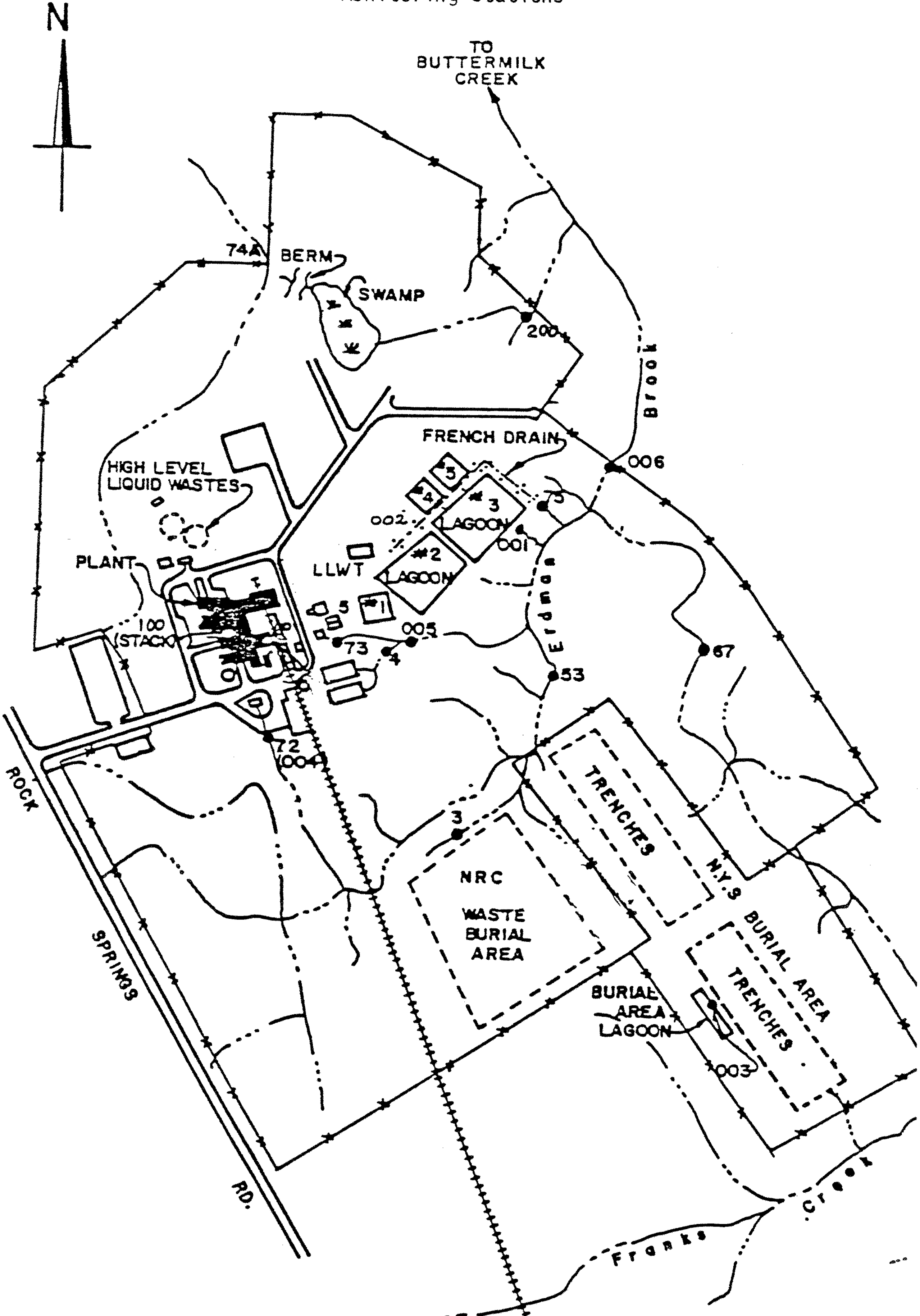


Figure 2 - Locations of Off-Site Environmental Monitoring Stations

Figure 3 - Locations of Effluent and On-Site Monitoring Stations



most limiting airborne particulate radioactivity. Results of sample analyses are presented in Table 1. Based on these measurements, no discernible off-site influence is evident from airborne radioactivity originating at site activities when compared to the 1981 background data from the New York State Department of Environmental Conservation program where the gross beta activity averaged 6.8×10^{-14} µCi/ml (Reference 1).

The plant ventilation large-volume stack samples provide the only detectable source of determining the released amount of certain specific radionuclides including Sr-90 and I-129. The average monthly activity levels for gross alpha and beta radioactivity from the stack based on the 52 weekly filter measurements and three of the four quarterly composites for specific radionuclides are shown in Table 2. The concentration of airborne radioactivity from the stack is well within the concentration guides for airborne radioactive materials in unrestricted areas.

Water Sampling

Off-site water samples are collected continuously from Cattaraugus Creek just downstream of the confluence with Buttermilk Creek which drains the WNYNSC (Figure 2). The Cattaraugus Creek sampler continuously samples a small volume of water from the Creek (approximately 400 ml/hr); a stream stage-level chart recorder provides a means of flow-weighting the weekly composite based on relative stream depth. Gross alpha, beta, and tritium analyses are performed each week, and a weighted monthly composite is analyzed for Sr-90 and gamma-emitting isotopes. A grab sample is taken monthly from a background location at Cattaraugus Creek upstream of the Buttermilk Creek confluence; it is analyzed for gross alpha, beta, and tritium. The most elevated samples from Cattaraugus Creek showed Sr-90 to be more than two orders of magnitude below the concentration guide values for unrestricted effluent. Gross alpha and gamma-emitting isotopes were so low as to be below detection levels in Cattaraugus Creek water (Table 3).

In addition to the surface water sampling, several well water supplies were sampled from privately owned off-site wells. The approximate locations are shown in Figure 4. These wells will be monitored on a long-term basis for gross alpha, gross beta, and tritium. A gamma isotopic analysis was also performed in 1982, for the initial well samples collected, to establish a baseline for future reference (Table 4). There were no indications of site-originated radionuclides in any of the water samples analyzed.

TABLE 1

PERIMETER AIR SAMPLER RESULTS (μCi/ml)

Month	Fox Valley (3)		Route 240 (7)		Thomas Corners (11)	
	Gross α $\times 10^{-16}$	Gross β $\times 10^{-14}$	Gross α $\times 10^{-16}$	Gross β $\times 10^{-14}$	Gross α $\times 10^{-16}$	Gross β $\times 10^{-14}$
March	<2.05	1.49 ± 0.33	<1.83	1.94 ± 0.38	<2.27	1.88 ± 0.46
April	1.91 ± 1.80	1.88 ± 0.37	<2.68	2.53 ± 0.50	<2.18	±0.48
May	2.75 ± 2.31	1.83 ± 0.37	4.50 ± 4.25	2.26 ± 0.44	<2.25	2.06 ± 0.48
June	1.88 ± 1.83	1.67 ± 0.35	<2.59	2.43 ± 0.48	<3.14	2.76 ± 0.55
July	2.59 ± 2.36	1.67 ± 0.35	<3.28	2.15 ± 0.43	3.11 ± 2.91	1.69 ± 0.43
August	<2.04	1.41 ± 0.32	<2.37	1.37 ± 0.27	3.75 ± 3.48	1.74 ± 0.43
Sept	3.34 ± 2.62	1.58 ± 0.31	3.85 ± 3.62	1.79 ± 0.35	4.25 ± 3.51	1.61 ± 0.32
Oct	1.96 ± 1.87	1.31 ± 0.31	<3.38	1.72 ± 0.34	2.79 ± 2.72	1.39 ± 0.38
Nov	1.72 ± 1.66	1.11 ± 0.29	<1.95	1.43 ± 0.27	<2.15	1.92 ± 0.45
Dec	< 1.38	1.12 ± 0.30	<2.20	1.25 ± 0.25	<1.38	1.43 ± 0.38

All values reported are monthly averages of weekly samples. Counting error is ± two standard deviations.

Note: See Table 8 for applicable standards.

TABLE 2

Stack Sampler Monthly and Quarterly Composite Results

*Month	Gross α $\mu Ci/ml \times 10^{-14}$	Gross β $\mu Ci/ml \times 10^{-12}$
March	2.00 ± 1.31	2.10 ± 0.10
April	2.17 ± 1.36	3.22 ± 0.12
May	2.32 ± 1.41	1.40 ± 0.08
June	< 0.82	0.54 ± 0.05
July	1.42 ± 1.10	0.78 ± 0.06
August	< 0.82	0.71 ± 0.06
September	1.62 ± 1.18	0.46 ± 0.05
October	1.60 ± 1.17	0.72 ± 0.06
November	1.61 ± 1.18	3.94 ± 0.14
December	2.67 ± 1.31	1.60 ± 0.09

Stack Sampler

**Quarter 1982	Sr-90 $\mu Ci/ml \times 10^{-13}$	Ru-106 $\mu Ci/ml \times 10^{-14}$	I-129 $\mu Ci/ml \times 10^{-15}$	Cs-134 $\mu Ci/ml \times 10^{-14}$	Cs-137 $\mu Ci/ml \times 10^{-12}$
First	7.49 ± 0.25	< 3.50	< 0.62	2.75 ± 0.50	1.22 ± 0.02
Second	2.75 ± 0.25	< 5.00	6.49 ± 1.50	< 0.62	0.17 ± 0.02
Third	0.72 ± 0.03	< 4.50	< 1.50	< 0.50	0.15 ± 0.01
Fourth	2.13 ± 0.10	< 1.28	N/A	1.04 ± 0.21	1.10 ± 0.03

Note: See Table 8 for applicable standards.

*Values reported are monthly averages of weekly samples. Counting error is ± two standard deviations.

**Values reported are quarterly composites of weekly samples. Counting error is ± two standard deviations.

Table 3

Radioactivity in Surface Water

Month 1982	Cattaraugus Creek									
	Bigelow Bridge			Felton Bridge						
	Monthly Grab			Continuous Sampler Monthly Composite						
	Gross α $\mu Ci/ml \times 10^{-10}$	Gross β $\mu Ci/ml \times 10^{-8}$	^3H $\mu Ci/ml \times 10^{-6}$	Gross α $\mu Ci/ml \times 10^{-10}$	Gross β $\mu Ci/ml \times 10^{-8}$	^3H $\mu Ci/ml \times 10^{-6}$	Sr-90 $\mu Ci/ml \times 10^{-9}$	Ru-106 $\mu Ci/ml \times 10^{-8}$	CS-134 $\mu Ci/ml \times 10^{-9}$	CS-137 $\mu Ci/ml \times 10^{-9}$
Mar	<2.69	0.74±0.26	1.17±0.18	<5.18	1.46±0.48	1.13±0.17	0.58±0.37	<2.1	<2.0	<2.1
Apr	<2.69	0.37±0.36	1.25±0.17	<4.73	1.37±0.46	0.73±0.17	0.87±0.50	<1.9	<2.3	<2.2
May	<2.03	0.63±0.43	0.76±0.17	<3.57	0.91±0.51	0.27±0.18	0.96±0.33	<1.9	<2.0	<2.1
June	<3.74	0.98±0.54	0.48±0.19	<5.18	1.94±0.59	0.55±0.18	1.14±0.48	<3.7	<3.6	<4.0
July	<2.94	0.68±0.38	0.86±0.18	<4.22	<0.39	1.15±0.17	0.68±0.54	<3.9	<3.7	<3.9
Aug	<4.02	1.07±0.49	2.16±0.26	<4.38	0.80±0.44	5.59±0.24	0.83±0.34	<4.4	<4.3	<4.5
Sept	<3.15	0.94±0.31	1.10±0.18	<6.46	1.30±0.36	1.10±0.19	0.91±0.31	<5.0	<4.8	<5.1
Oct	<3.11	0.79±0.30	0.44±0.26	<5.74	0.54±0.28	1.21±0.20	0.79±0.29	<2.5	<2.5	<2.4
Nov	<2.65	0.31±0.25	0.50±0.17	<8.04	1.62±0.37	1.69±0.19	0.56±0.37	<4.7	<4.8	<5.0
Dec	<3.19	0.73±0.25	1.66±0.18	<5.10	0.90±0.30	0.84±0.17	NA	NA	NA	NA

NA - Not Applicable

Note: See Table 8 for applicable standards.

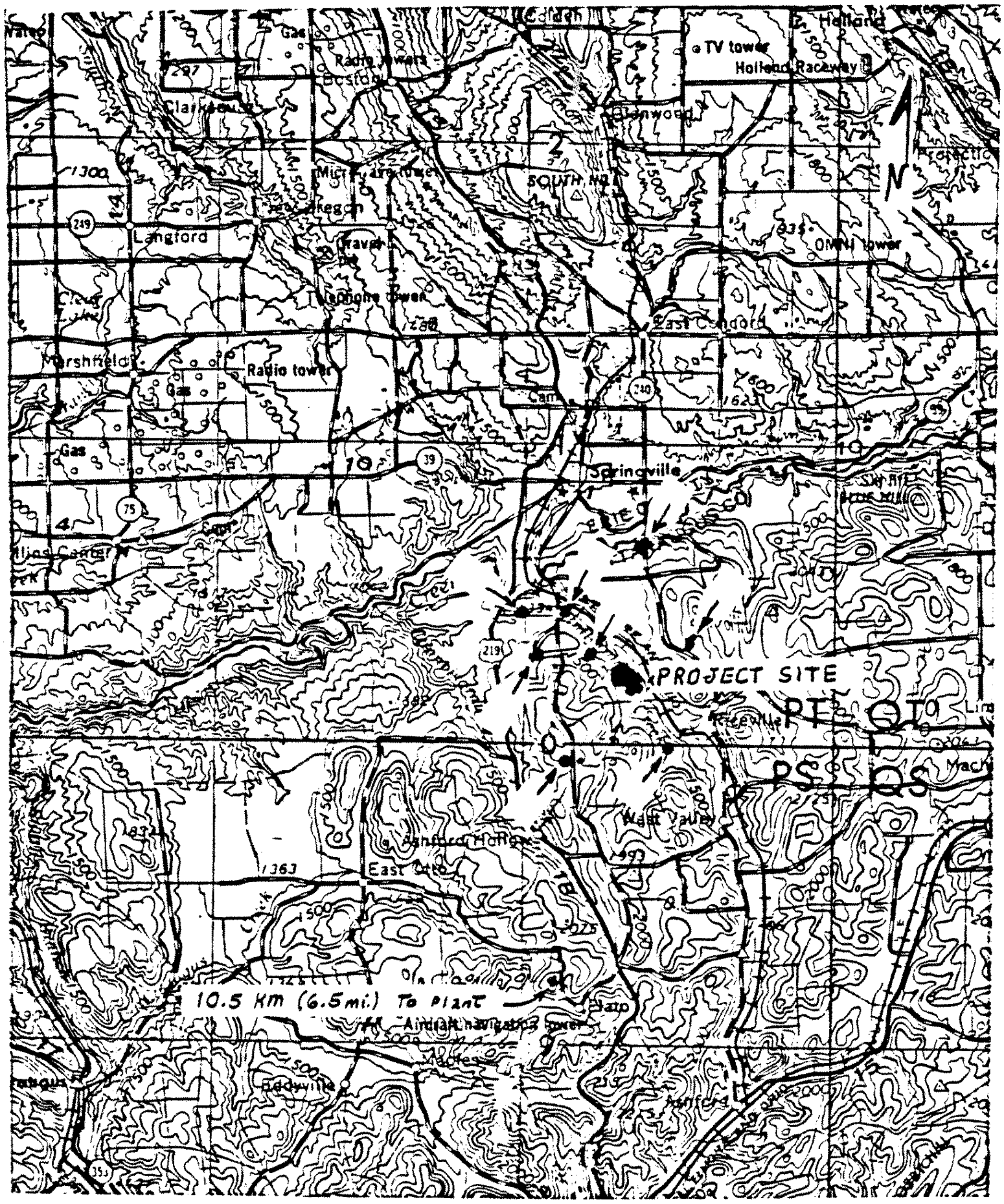


Figure 4 - Location of Off-Site Private Drinking Water Wells Sampled in 1982

TABLE 4

PRIVATE WELL SAMPLING RESULTS (PICOCURIES/LITER)

Location	Gross Alpha	Gross Beta	Tritium (HTO)	Gamma Spectroscopy	Isotope
A	1.0 ± 0.2	**<9.0	**<260	48.6 ± 28	Cs-137
B	0.5 ± 0.2	**<9.0	440 ± 270	**<28.0 517 ± 320	Cs-137 K-40*
C	0.6 ± 0.2	**<10.0	**<250	**<34.0 55.9 ± 45	Cs-137 Bi-214*
D	3.0 ± 1.0	**<50.0	**<290	**<30.0	Cs-137
E	0.2 ± 0.2	5.0 ± 5.0	440 ± 260	**<35.0 391 ± 280	Cs-137 K-40*
F***	0.6 ± 0.2	5.0 ± 5.0	540 ± 280	37.8 ± 27	Cs-137
G	0.2 ± 0.2	**<5.0	**<260	16.2 ± 16	Cs-137
H	0.3 ± 0.2	6.0 ± 5.0	**<260	**<30.0 606 ± 330	Cs-137 K-40*
I	2.9 ± 0.4	8.0 ± 5.0	**<260	**<36.0 64.8 ± 46	Cs-137 Bi-214*
Niagara Falls (Reference 1)	**<8.0	4 ± 1.9	400 ± 300	- -Not Reported- -	
Distilled Water (Locally Purchased)	0.7 ± 0.2	**<4.0	**<250	**<11.0	Cs-137

* Naturally Occurring Radioactivity
** Not Detectable
***F is a remote well over six miles away from the plant which serves as a "background" reference point.

Note: Tritium values and NYSDEC sample reported at the 95-percent confidence level (2 sigma). The remaining values are at the 68-percent confidence level (1 sigma). Sample D had an unusual amount of dissolved solids which decreased the analytical sensitivity.

Biological Sampling

Semiannually in the spring and fall a sample of fish is taken from the upper section of Cattaraugus Creek behind the Springville Dam which is influenced by the site drainage. Nine fish during each period are collected and analyzed for Sr-90 in the flesh and bone, and for gamma-emitting isotopes in the flesh. A white-tailed deer is also collected from the WNYNSC during the hunting season and analyzed for Sr-89/90 and Sr-90/gamma emitting isotopes in the bone and meat respectively. A milk sample from two farms, one each in the northwest and northeast direction from the site, is taken in late summer after the cattle have been on fresh forage for several months.

These data, listed in Table 5, represent biological radionuclide uptake in the human food chain from all identified transport pathways: surface water, milk, airborne deposition, and biota transport. The deer meat analyzed showed no evidence of fission product gamma emitters and a barely detectable concentration of Sr-90 in the ashed sample. The femur bone tested had a detectable deposition of Sr-90 but no Sr-89 was detected.

The two milk samples from dairy herds foraging near the site perimeter indicated no site-originated radioactivity. The measured amount of Sr-90 was statistically well within the 3 pci/l average background from the control location for Sr-90 in milk for 1981 (Reference 1).

Table 5 Radioactivity in Milk, Deer and Fish

Milk - August 1982

	Concentration (µCi/ml)			
	Sr-90	I-129	Cs-134	Cs-137
NE Farm	3 ±1 E-9	<2 E-9	<1 E-8	<1 E-8
NW Farm	4.1 E-9	<2 E-9	<1 E-8	<1 E-8

Deer - December 1982

	Concentration (µCi/kg)			
	Sr-89	Sr-90	Cs-134	Cs-137
Flesh	--	4 ±3 E-6	<1.8 E-6	<5.7 E-6
Skeleton	<9.5 E-6	5.3 ±.24 E-5	--	--

Fish - 2nd Quarter 1982

	Concentration (µCi/kg)			
	Flesh			Skeleton
	Sr-90	Cs-134	Cs-137	Sr-90
Median	1.74×10^{-3}	3.7×10^{-3}	3.62×10^{-3}	1.63×10^{-3}
Average Geometric Deviation	4.6	2.0	1.9	4.04
Maximum	$1.1 \pm 0.2 \times 10^{-2}$	$<1.0 \times 10^{-2}$	$<1.0 \times 10^{-2}$	$1.3 \pm 0.1 \times 10^{-2}$
Minimum	$3.4 \pm 1.7 \times 10^{-4}$	$<5.0 \times 10^{-4}$	$<5.0 \times 10^{-4}$	$2.4 \pm 1.4 \times 10^{-4}$

Fish - 3rd Quarter 1982

	Concentration (µCi/kg)			
	Flesh			Skeleton
	Sr-90	Cs-134	Cs-137	Sr-90
Median	1.95×10^{-4}	7.6×10^{-4}	7.6×10^{-4}	4.28×10^{-4}
Average Geometric Deviation	2.4	1.4	1.4	1.4
Maximum	$1.2 \pm 0.3 \times 10^{-3}$	$<1.6 \times 10^{-3}$	$<1.6 \times 10^{-3}$	$<6.0 \times 10^{-3}$
Minimum	$<1.0 \times 10^{-4}$	$<5.0 \times 10^{-4}$	$<5.0 \times 10^{-4}$	$<3.0 \times 10^{-4}$

Fish taken from the Cattaraugus Creek downstream of site effluents showed some uptake of Sr-90, but Cs-134/137 was not detected. No recent background levels are available for fish from an isolated water course within this region.

Environmental Radiation

Ambient radiation is measured using $CaSO_4$:Tm thermoluminescent dosimetry (TLD) monitors posted at 16 locations around the WNYNSC perimeter (Figure 2). Because of the inaccessibility of the entire perimeter boundary line, especially during the winter months, the TLD's are mounted one meter from the ground surface near the closest access road to the fence line sector being monitored. The monthly data presented in Table 6 are indicative of natural background levels typical of cosmic and terrestrial radiation in this region.

Supporting Measurements

Because of the extremely low levels of radioactivity detected in off-site samples (at or near the limit of detection), release data taken at effluent discharge points is used to support the validity of environmental measurement and to demonstrate compliance with applicable standards. For airborne radioactivity this point is the main ventilation stack (see Table 3). Liquid effluents are sampled at the discharge point where each batch of treated effluent is released (Table 7). Using measured values, there were 8,393,000 gallons of liquid effluent released in batches from the treatment system. Of this amount, 95,000 gallons originated from the New York State operated low-level waste burial (LLWB) ground liquid holding reservoir. A total of 3.8 millicuries of Sr-90 and 940 millicuries of H-3 were received from the LLWB reservoir in 1982 and processed along with the plant maintenance effluents. The discharge to the environment from the plant treatment system was 27.7 mCi of gross beta activity, excluding the 9.51 curies of tritium also released; no detectable alpha activity was released. Table 7 summarizes specific isotopes released in liquid effluent; at no time during the year did the release concentrations exceed the DOE 5480.1, Chapter XI, concentration guides for effluent released to uncontrolled areas. These isotopes were, with the exception of H-3 and Sr-90, not detectable at the the Cattaraugus Creek sampling location (the nearest point accessible to the general public).

The airborne radioactivity measured at the plant ventilation stack showed some detectable I-129 during the second quarter of 1982 (Table 1). Based on this detected amount, the total release was 0.004 millicuries of I-129 for the

TABLE 6

ENVIRONMENTAL RADIATION EXPOSURES

MARCH TO DECEMBER 1982

+Location Number	10-Month Exposure (mr)++
1	68 ± 8
2	65 ± 7
3	60 ± 8
4	63 ± 7
5	64 ± 8
6	61 ± 6
7	57 ± 8
8	61 ± 6
9	64 ± 7
10	61 ± 5
11	69 ± 7
12	*58 ± 5
13	69 ± 7
14	64 ± 7
15	64 ± 6
16	**58 ± 5

*Three data months not available.
**One data month not available.
+See Figure 2 for dosimeter orientation from site.
++Ten-month exposure ± two standard deviations.

Note: Recent background integrated annual exposures are not available. 1968 to 1972 background averaged over ten months ranges from 29 to 102 mR (Reference 4. See Table 8 for applicable standards).

TABLE 7

RADIOACTIVITY DISCHARGED TO
THE ENVIRONMENT IN 1982 FROM LOW-LEVEL WASTE TREATMENT FACILITY

Release Period	Isotope	Concentration µCi/ml	(Ci) Total Activity
June 14, 1982 to June 28, 1982	H-3	3.68 ± 0.07 E-4	3.36
	Sr-90	1.21 ± 0.12 E-7	1.11 E-3
	Ru-106	<2.7 E-8	<2.47 E-4
	I-129	<3.48 E-9	<3.18 E-5
Volume (ml) Released 9.14 E+9	Cs-134	<3.5 E-9	<3.20 E-5
	Cs-137	<1.2 E-9	<1.10 E-4
August 11, 1982 to August 20, 1982	H-3	3.39 ± 0.07 E-4	2.29
	Sr-90	1.30 ± 0.13 E-7	8.78 ± E-4
	Ru-106	<2.5 E-8	<1.69 E-4
	I-129	<2.00 E-8	<1.35 E-4
Volume (ml) Released 6.75 E+9	Cs-134	1.7 ± 0.38 E-8	1.15 E-4
	Cs-137	6.7 ± 0.67 E-7	4.52 E-3
December 1, 1982 to December 23, 1982	H-3	2.43 ± 0.05 E-4	3.86
	Sr-90	2.0 ± 0.1 E-7	3.18 E-3
	Ru-106	*ND	*ND
	I-129	5 ± 5 E-10	7.95 E-6
Volume (ml) Released 1.59 E+10	Cs-134	*ND	*ND
	Cs-137	8.97 ± 0.80 E-7	1.43 E-2

Annual Total Release Total Volume (ml)	Isotopes	Total Activity (Ci)
March - December 1982	H-3	9.51
	Sr-90	5.17 E-3
3.18 E+10 (ml)	Ru-106	<4.16 E-4
8.4 E-6 gallons	I-129	<1.75 E-4
	Cs-134	<1.47 E-4
	Cs-137	1.89 E-2

Note: See Table 8 for applicable standards.

*Not detected. No minimum sensitivity available.

6.71×10^8 cubic meters (2.37×10^{10} cubic feet) of air exhausted during the entire year. Other measured releases for the year included 0.011 millicurie of gross alpha activity and 1.00 millicurie of gross beta activity. Included in the gross activity are 0.160 mCi of Sr-90, 0.022 mCi Ru-106, 0.006 mCi Cs-134, and 0.363 mCi Cs-137. The total activity of 1.01 mCi released during the year is 0.03 percent of technical specification limits.

Using the effluent data, the calculated values of otherwise nondetectable isotopes can be considered in the evaluations made of environmental dose impacts.

Non-Radiological Environmental Monitoring Program

Non-radiological emissions and plant effluents are controlled and permitted under the New York State and USEPA pollution discharge elimination system. Permits for airborne emissions from the main ventilation stack, two natural gas-fired boilers, the LLWT plant ventilation system and acid tank vents, and an office paper waste incinerator are all covered under NYS permits. Plant liquid effluents covered by the National Pollution Discharge Elimination System (NPDES) include two points in the LLWT process stream (points 001 and 002), the sewage treatment plant effluent (004), the steam system condensate and water treatment filter drain (005) and the combined plant effluent discharge point (006). See Figure 3.

Although there are periodic New York State inspections of the air emissions points, routine sampling and analysis of non-radiological emissions from these points is not required by the permits. Discharges from these points are well below the levels requiring monitoring under the permit system. The water effluent points are sampled for specific chemical parameters depending on the effluent stream characteristics. Liquid effluents are monitored for heavy metals (Ba, Cr, Cu, Pb, Mn, Ni, Zn), ammonia, suspended solids, pH, and temperature at point 001 during lagoon discharges. Suspended solids are also measured in the LLWT plant process stream (002), in the clarifier overflow ditch (005) and the sewage treatment plant outfall (004); pH and BOD are measured at 004 as well. Point 006 is measured for total iron, ammonia, pH and temperature. Radioactivity is reported also for points 004 and 001 under the SPDES reporting system, but radionuclide discharge limitations are not imposed by the state permits.

In 1982 no parameters were found to be above the permitted concentration except for total iron at point 006. The high iron concentration, less than 4 times the 1 mg/liter limit for iron in water, were traced to an intermittent source resulting from normal periodic backwashing of a site potable water purification filter. The concentration of naturally occurring iron from the raw water passing through the filter was seen downstream of the filter backwash conduit (Figure 3, location 73). Although the annual average level of iron was below the maximum allowable concentration, the individual measurements were reported as being out of compliance in accordance with the permit conditions. Mitigating measures are currently being implemented to alleviate the problem; no discernible impacts on the environment were caused by the iron concentration excursions in 1982.

IV. RADIOLOGICAL IMPACT OF WVDP OPERATIONS

General

The radiological impact of WVDP operations on the resident public surrounding the site was too small to be measured by the routine off-site environmental monitoring program. In lieu of estimating the impact by direct monitoring, it is necessary to indirectly evaluate the impact by calculating:

- The dose to a maximum individual at point of highest concentration of radioactive materials predicted using meteorological and effluent monitoring data.
- The dose to a maximum individual at the WNYNSC boundary from water mediated pathways.

Maximum Individual Dose

It was noted in Section II of this report that work is currently under way to better define the pathways to man and local meteorological data. The data used in performing the dose calcuations is based on that available in Reference 2 for the maximum individual using meteorological data reported in Reference 3. For the purposes of this report, the pathways evaluated for the maximum individual include:

- Inhalation of airborne radioactive materials,
- External radiation exposure from radioactive materials deposited on ground surfaces or immersion in contaminated air,
- Ingestion of drinking water from Cattaraugus Creek at the WNYNSC boundary,
- Ingestion of milk produced by cows watered in Buttermilk Creek,
- Ingestion of fish from Cattaraugus Creek,
- Ingestion of game animals.

Data are not available at this time to permit calculation of a population dose because more complex models and meteorological data not available at this time are required to perform such calculations. The airborne mediated pathways include inhalation of radioactive materials, immersion in contaminated air and exposure to contaminated ground surfaces. For the purpose of this calculation, it was assumed that the maximum individual was located at the point of highest ground level concentration with respect to the discharge point. Based on the annual airborne release of 1.01 mCi gross radioactivity and the isotopic distribution presented in Section III, the maximum individual 50-year dose commitment would be less than 1×10^{-4} mrem/yr from all airborne-mediated pathways based on continuous occupancy at the maximum location during 1982.

Water-mediated pathways evaluated include a maximum individual who takes his entire year's drinking water supply from Cattaraugus Creek at the WNYNSC boundary. This is extremely conservative since the creek water is not used for a drinking supply and the boundary location represents the point of maximum concentration accessible to the general public. Using the data presented in Section III and the assumptions in Reference 2 the total dose to the maximum individual would be 5.85 millirem as a 50-year dose commitment from water ingested during 1982.

A potential water - cow - milk - man pathway exists in the area of Buttermilk Creek as a result of stock watering at private access to the creek. This pathway was considered for evaluation; however, it was not used because the concentration at the background location yielded a higher concentration than the sample taken at the postulated maximum location.

Fish collected from the Cattaraugus Creek are typically bottom-feeding rough fish, usually considered not suitable for human consumption. As there is little sport fishing in the section of stream from which the fish are collected, the general assumptions for human consumption rates are not applicable to this sample. Specific information is not yet available for defining this pathway; it is noted, however, that the median values for the two sample groups in 1982 are within the range of values previously reported by NFS (Reference 5).

The adult female deer collected by WVNS on the site showed a barely detectable Sr-90 uptake well below the lower range of samples from the immediately preceding three years. This pathway, although broadly defined, is not sufficiently detailed to assess a dose from meat consumption. The analysis of additional samples to assure representative data is required to provide a valid dose calculation for venison consumption.

V. ENVIRONMENTAL STANDARDS AND REGULATIONS

The following environmental standards and regulations are applicable at the WVDP Site boundary.

> "Requirements for Radiation Protection," Chapter XI, DOE Order 5480.1, August 1981.
>
> U. S. Federal Radiation Council, Background Material for the Development of Radiation Protection Standard, Report No. 1, (1960) and Report No. 2 (1961), Superintendent of Documents, U. S. Government Printing Office, Washington, D.C.
>
> U. S. Environmental Protection Agency, National Primary and Secondary Ambient Air Quality Standards, 40 CFR 50, 1980.
>
> U. S. Environmental Protection Agency, Drinking Water Regulations, 40 CFR 141, 1980.
>
> Department of Environmental Conservation, State of New York, Environmental Conservation Law of New York State, Title 8, Article 19, October 18, 1972.

The standards and guides for releases of radionuclides at the WVDP are those of DOE Order 5480.1, Chapter XI, dated August 13, 1981, entitled Requirements for Radiation Protection. Radiation protection standards and selected radioactivity concentration guides from Chapter XI are listed in Table 8. The most restrictive guide is listed when there is a difference between soluble and insoluble chemical forms. These listed guides are identical to those in the Code of Federal Regulations, Title 10, Part 20.

Ambient air and water quality standards are contained in the individual SPDES permits issued for the facility.

TABLE 8

STANDARDS AND CONCENTRATION GUIDES
(DOE Order 5480.1, Chapter XI)

Radiation Protection Standards
Annual Whole-Body Dose Equivalent (mrem/year)

Individuals at points of maximum probable exposure	500
Suitable sample of the exposed population	170

Concentration Guides for Effluent Releases to Uncontrolled Areas (μCi/mL)

Radionuclide	In Air	In Water
Gross Alpha	2×10^{-14}	3×10^{-8}
Gross Beta[a]	1×10^{-12}	3×10^{-8}
Am-241	2×10^{-13}	4×10^{-6}
Sb-125	9×10^{-10}	1×10^{-4}
Ar-41	4×10^{-8}	—
Ba-140	1×10^{-9}	2×10^{-5}
Cs-134	4×10^{-10}	9×10^{-6}
Cs-137	5×10^{-10}	2×10^{-5}
H-3	2×10^{-7}	3×10^{-3}
I-129	2×10^{-11}	6×10^{-8}
I-131	1×10^{-10}	3×10^{-7}
Kr-85	3×10^{-7}	—
Kr-85m	1×10^{-7}	—
Kr-87	2×10^{-8}	—
Kr-88	2×10^{-8}	—
Pu-238	7×10^{-14}	5×10^{-6}
Pu-239	6×10^{-14}	5×10^{-6}
Pu-240	6×10^{-14}	5×10^{-6}
Ru-106	2×10^{-10}	1×10^{-5}
Sr-90	3×10^{-11}	3×10^{-7}
Xe-133	3×10^{-7}	—
Xe-135	1×10^{-7}	—
Xe-138	3×10^{-8}	—

[a]Based on the most restrictive beta emitter (Ra-228).

VI. REFERENCES

1. New York State Department of Environmental Conservation, Annual Report of Environmental Radiation in New York State - 1981, RAD-P3, November 1982.

2. U.S. Nuclear Regulatory Commission, Regulatory Guide 1-109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR, Part 50, Appendix I, Revision 1, October 1977.

3. Nuclear Fuel Services, Inc., Environmental Report, NFS' UF_6 Plant, West Valley, New York, Docket Number 70-1701.

4. U.S. Department of Energy, Western New York Nuclear Service Center Study Companion Report, TID-28905-2, November 1978.

5. Wilcox, D. P. and Smokowski, R. T., Nuclear Fuel Services Environmental Reports, Nuclear Fuel Services, West Valley, New York, Numbers 25 through 31, July 1978 - December 1981 inclusive.

APPENDIX A
QUALITY ASSURANCE

The radiochemical analyses for the environmental samples collected during 1982 were performed by off-site laboratories. A documented laboratory Quality Assurance plan is used for these laboratories, including periodic inter-laboratory cross-checks, prepared standard and blank analyses, routine instrument calibration, and use of documented procedures. Radiometric counting at the site laboratory was in accordance with written procedures, including the use of appropriate calibration sources where applicable. There are no facilities, however, for preparing standards and blind samples for use in the on-site laboratory.

Nonradiological analyses are also performed by a qualified contract laboratory. WVNS subscribes to the NPDES cross-check program sponsored by the U. S. Environmental Protection Agency to assure the accuracy of contract laboratory results.

APPENDIX B
STATISTICAL METHODS

Individual analytical results are reported (except where noted) with plus or minus (±) two analytical standard deviations (2 σ) where all counting errors have been propagated. Where the 95-percent confidence interval (± 2 σ) included a negative number, a "less than" result was reported. The numerical value following a "less than" is the statistical counting minimum detection limit used for that analysis. Arithmetic averages reported are conservative in that negative results are not used in reducing a series of numbers containing positive values.

Since it is the accepted practice of the commercial laboratories and site procedures used in sample analysis, the term "less than" to denote a lower statistical limit is used in this report.